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Research Article

An analytical study on the impact of overpopulation in the context of Sustainable Development and Public Health

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Abstract

In the present era, among all the other predicament, the human kind suffering most from, is the overburden of population, which has been considered a contemporaneous issue throughout the globe, The population-density tendency today is delineated by an incremental branching across the developed and developing countries. The humanity had already witnessed grievous natural calamities as a result of environmental consequences. Hence the purpose of this study is to understand the aftermath of overpopulation towards sustainability considering the 3 pillars of sustainability namely environment, society, and economy and also on the public health. The researcher seeks to find out the factors associated with the population hindering the sustainable development of a developing country which had been done through exploratory factor analysis. Several hypotheses had been formed to understand the significance of impact of overpopulation on economy, environment, society and public health through several parametric and non-parametric tests. This study is combination of exploratory and descriptive research design and a single questionnaire had been created and administered in different areas of the study to understand the awareness level of the population by the researcher. Finally, this study will elucidate the consequences of overpopulation precisely in context of sustainable development and public health.

Keywords: Overpopulation, Sustainable development, public health, Exploratory factor analysis.

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1.1 Introduction

There exists a close and reciprocal relationship between population growth and sustainable development in a country. The population creates a source of labor that could be used to fastened the country's production. On the other hand, it could also be seen as a consumer group that uses and exhausts a large quantity of the country's resources. However, certain researchers from the earlier times have pointed out that the increase of population and the rapid growth of population in a country is tied to its economy. But the opinion of some other researchers is that though the population can increase exponentially in a country, its environmental resources are limited, and as a consequence this could prove to be a barrier to the sustainable development of the country. In the midst of these arguments the demographic transition theory attempts to clarify the relationship between population growth and sustainable development. Those who viewed it in a different way have adopted a benign attitude towards mass increase; that is, they considered it is not necessary to control the population growth of a country. According to them the increase in population does not bring bad results all the time. The pessimists look this situation differently and assert that if a country is to attain a higher state of development, the population growth should be reduced. That is, they claim that during the process of sustainable development population growth should be controlled. The social science researchers are of the opinion that an increased fertility rate and the resulting huge population growth act as a damper on sustainable development. The main objective of this paper is to examine the literature on the inter-relationship between population growth and sustainable development from both an optimistic angle as well as from a pessimistic angle. We can also consider the effect of sustainable development on population growth. In a country that has not yet attained satisfactory sustainable development, the birth and death rates will be rather high. When a country enters an era of sound sustainable development, more nutritious food will be consumed by the people and advanced medical care will also improve the life expectancy of the people. Due to the medical advances, ample supply of food items, and better sanitation brought forth by sustainable development there will be a sharp drop in the death rate.

2.1 Literature review and research gap

According to optimists like Balon (2012), development in a country without population growth will cause problems. When the population increases, they expect the savings and investments also to increase. When the population decreases, the production, capital accumulation, employment, incomes and savings will also decrease and may negatively affect the development.

As per Bhalla (2018), modern time environmental issues have fueled the production and marketing of electric vehicles from the year 2018. The concept of over population has revolutionized the Indian economy and also it had stated the perception that from economical perspective Indian market is considered to be the best market around the globe for global auto makers as it consist of cheap labors, geo-economic advantages, huge customer-base and also cheaper production cost, hence it is very much favorable for the automobile industries to implement such concept in the market.

It is evident that control of population explosion can and must have an instrumental role in reducing the emission of greenhouse gases in the environment, but it cannot be expected to have an immediate effect, with proper awareness and policies it can be achieved as stated by Gayathri (2016).

Hundal (2015) had stated that, in the last few years the concern towards ecological aspects and its degradation has been insulated more then ever. In spite of the fact, that there are multiple differences in the

opinion but still when it comes to safeguard the natural resources irrespective of different perception, they have illuminated harmonical uniformity of opinion.

As the environmental issues have been the major concerns for almost all the sectors in the society the organizations and the employees must work together with collaboration in order to achieve the sustainability spectrum within the organization as stated by Searcy (2009).

There are more pertinent branches of branches of management, however among all other, mass management stand out especially when it comes to technical front as per Seuring (2008).

As per Sukati (2012), the growth of population will cause a strong demand for goods that will make it possible to establish a good market as well as increase the demand for capital and population growth will speed up economic development.

According to Verma (2006), due to the present challenging condition and market saturation the structure of supply chain has become more composite in nature and along with that understanding and controlling, monitoring with this situation has become more difficult.

Sustainable development in context of eco-friendly cars is a new concept with two-dimensional approach, which apparently a new concept in the recent trends. Most of the research concentrated on the operations even emphasized on the sustainability aspects in terms of the synergy between technology and environmental aspects but there are very limited literatures available on these aspects in context of population growth and sustainable development. This research seeks to find out the factors that are essential and plays a pivotal role in implementing environmentally friendly practices in the organization.

2.2 Objective of the study

Main objective of the present study is to identify the factors affecting the implementation or impact of population explosion on the sustainability or sustainable development of the nation, followed by the understanding of the factors (independent) extracted from the different variables on the dependent variable, which is sustainability aspect of the population.

3.1 Research Methodology

This study includes the analyses using a combination of exploratory and descriptive research designs with a major focus on making use of inferential statistical procedures. The primary data was collected from eighty employees from various organizations of Kolkata with different job positions and responsibility and the secondary data was collected from websites, journals, magazines etc. Exploratory factor analysis (EFA), chi-square tests for independence of categorical variables, step-wise regression model, have been used to analyze the data with the help of the statistical software SPSS v.25.

A structured set of questionnaires were used for collecting the primary data, which was consists of questions for understanding the importance level towards implementing sustainability, the perception level towards eco-friendly cars, measured with the questions collected on a 4-point scale, where ‘1’ represents lowest perception level, ‘4’ indicates the highest.

First the relationship between main characteristics of the sustainability and their perception, awareness level has been examined using Pearsonian chi-square ($\chi 2$) test, a nonparametric test.

Next an exploratory factor analysis (EFA) has been done to identify the factors that mainly influence the organization to sustainable production system for eco-friendly cars. For the purpose of scale reliability, Cronbach alpha has been also obtained. The Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test have been used, respectively, for assessing sampling adequacy and testing sphericity. Finally, a step-wise regression model has been used to establish a relationship between importance level towards sustainability and the major factors, extracted by the method of factor analysis, which may influence the implementation decision, from which it will also be evident that which of the extracted factors have more effect on importance level of the organization to implement such system for production of eco-friendly cars.

4.1 Data analysis: Results and discussion

This section explains the results of (i) factor analysis, which identifies major factors of population explosion that affect sustainability, (ii) step-wise regression analysis, from which how the sustainability depends on various identified factors can be obtained.

I. *Exploratory factor analysis*

Study reveals that there are twelve essential parameters that are used for understanding the factors of population explosion that influence in achieving the sustainable development. In order to understand the consistency of the data collected, Cronbach alpha has been computed as a measure to assess the reliability, which ranges from 0 and 1.

Table 2. Reliability statistics

Cronbach alpha	Number of items
0.812	12

Table 2 shows the value of Cronbach alpha as 0.812, which is a high value from which it can be inferred that there is a presence of internal consistency of the items in the scale, and also it does not mean that the scale is one-dimensional and also the scales used for measuring sustainability which is reliable enough to understand and interpret. Here twelve parameters have been considered with Likert scale, which gives a reliable scaling measure through Cronbach alpha value. The crucial parameters found are as follows:

1. Unavailability of agricultural land
2. Land and soil degradation
3. Preservation of forest
4. Scarcity of food grains
5. Loss of Bio-diversity
6. Change in consumption pattern
7. Rising demand for energy
8. Air pollution
9. Water Pollution
10. Global warming and climate change
11. Unemployment
12. Abated inclusive growth

The KMO measure of sampling adequacy has been used to indicate the proportion of variance in variables that might be caused by underlying factors, e.g., high values (close to 1.0) generally indicate that a factor analysis may be useful with the data.

Table 3. KMO and Bartlett's test result

Kaiser-Meyer-Olkin measure of sampling adequacy	0.720
Pearsonian chi-square test-statistic (for Bartlett's test of sphericity)	375.400
Degrees of freedom (df)	66
p-value (for statistical significance)	.000

Table 3 shows that the *p*-value in Bartlett's test is less than 0.05, as a result of which it can be concluded that the statements are significant at level 0.05 (two-tailed test).

In this research, EFA has been used to explore the various dimensions of sustainability towards implementation in automobile industry. Principle component analysis has been used with varimax rotation depending on the assumption that any extracted factor important to attributes of the electric vehicles should be inter-related. Eigen value of 1 has been used as cut-off value for extraction. Four-factor structure with the extracted factors explaining 70.8% of the total variance has been identified. The KMO measure yields a value of 0.72, indicating that the data were suitable for factor analysis.

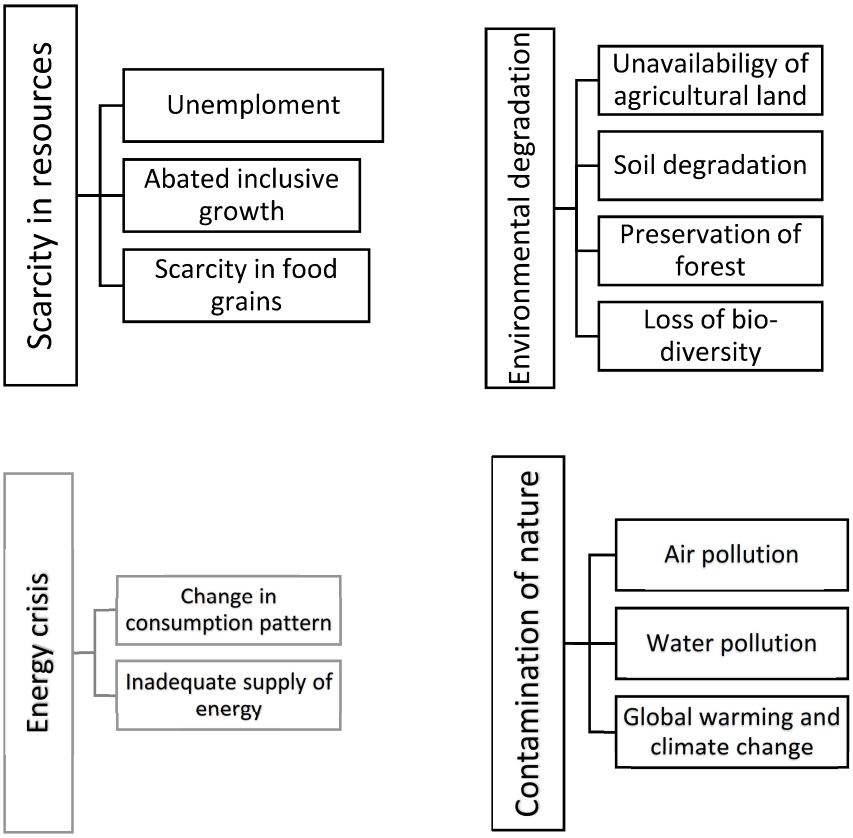

Figure 1. Factors affect the automobile industry towards sustainability

Figure 1 displays the four factors extracted from the twelve through EFA. For all of these four factors, the eigen values are more than 1. The grouping is based on the rotated component matrix. These four factors can be named as scarcity in resources, energy crisis, environmental degradation and contamination of nature. All of these factors are associated with sustainability and ecological aspects of the organization which can be achieved with effective and systemized implementation of eco-friendly practices within the organization.

III. *Step-wise regression model*

A step-wise regression have been done with all four factors to measure the sustainability of the organization. This stepwise regression model also shows how these four independent variables, viz., scarcity in resources, energy crisis, environmental degradation and contamination of nature, are impacting the dependent variable, *Y*, the sustainability.

Initially it started with the correlation analysis with every independent variable with the dependent variable that has been shown in table no. 4

Table 4. Pearson correlation value

Variables	Sustainability (Pearson correlation)
Contamination of nature	0.785
Energy crisis	0.762
Environmental degradation	0.712
Scarcity in resources	0.305

It can be seen that the highest correlation value with the importance level towards sustainability is with contamination of nature with 0.785 followed by energy crisis with 0.762 then environmental degradation with 0.712 and lastly Scarcity in resources with 0.305, now the step-wise regression can be done to understand the final independent variables that can be selected for the final multiple regression model.

The process will start from regression analysis with importance level towards sustainability considering it to be dependent variable (Y) and Contamination of nature(x) and then all the variables as per their correlation values they will be added sequentially and after adding each of the independent variables the R^2 values will be measured to witness if there is any significant change or not.

Table 5. R^2 values

Variable names	R^2 values
Contamination of nature	0.616
Contamination of nature and energy crisis	0.703
Contamination of nature, energy crisis, and environmental degradation	0.728
Contamination of nature, energy crisis, environmental degradation, and scarcity in resources	0.825

From table no. 5 it can be understood that when Contamination of nature variable is added with energy crisis variable the change in the R^2 value is quite significant similarly, when this both of the variables are added with environmental degradation variable the value has also increased and in the same manner when scarcity in resources have been added it also increased to 0.825 hence it can be concluded that all the variables can be included while running multiple regression model. Hence the final regression equation is as followed-

$$Y= 0.057+0.158x_1+0.350x_2+0.187x_3+0.301x_4$$

Here
X_1 = Contamination of nature
X_2 = Energy crisis
X_3 = Environmental degradation
X_4 = Scarcity in resources

5.1 Conclusion

In recent years, the elements of sustainability in an organization had been changed drastically, there had been a conglomeration and inclusions of several multidimensional aspects, which had given the understanding of optimum utilization of sustainability aspects in an organization towards a new direction. With the technological advancements, the corporates have realized the importance of sustainability and its implications. Sustainable development has been one of the most technical driven branches among other management branches. From the above research, it can be concluded that most of the organizations are aware of the growing concern of global warming and the importance of sustainability and also there had been certain factors that are considered for implementing sustainability aspects in the organization. The automobile industries are now being very much motivated and technological driven in indulging themselves in various measures to maintain certain protocol so that environmental goals can be achieved. They have also understood the need of being socially aware and their contribution to the society. As sustainable developmental practices are now being treated as one of the cataclysmic social responsibility of the organizations which are now adopting and implementing the viable and sustainable practices in almost all the areas of a company, not only to survive in the competitive age but also to stimulate the growing concern of environmental aspects in the society.

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